What is Claimed:

1. A system for transferring a plurality of scheduled data packets from at least one source to at least one destination, wherein the transfer of the scheduled data packets are provided during respective ones of a plurality of predefined time intervals, wherein each of the predefined time intervals is comprised of a plurality of predefined time frames, the system comprising:

a virtual pipe comprising at least two switches interconnected in a path via communication links, each of said switches having plurality of input ports and plurality of output ports;

a common timing reference signal coupled to each of the switches;

wherein for each of the input ports of each switch there is an associated a predefined position within a first predefined time frame within which a scheduled data packet is transferred into the respective input port and an associated separate predefined position within a second predefined time frame within which the respective scheduled data packet is transferred from the output port out of the respective switch.

2. The system as in claim 1, wherein for each switch, there are predefined positions within a predefined subset of the first predefined time frames during which the scheduled data packets are transferred into the input port of the switch and wherein there are additional predefined positions within an additional predetermined subset of the second predefined time frames during which the scheduled data packets are transferred from the output port out of the switch.

3. The system in claim 1, wherein the communication links are at least one of fiber optic, fiber optic with WDM (wave division multiplexing), wireless communication links.

4. The system as in claim 1, wherein the wireless communication links are at least one of ground station and satellite, and between two satellites orbiting the earth.

5. The system as in claim 1, wherein the scheduled data packets are at least one of Internet protocol (IP) data packets, fiber channel data packets, and asynchronous transfer mode (ATM) cells.

6. The system as in claim 1, wherein all the scheduled data packet forwarded over the same virtual pipe are assigned a pipe identification (PID) associated with that virtual pipe.

7. The system as in claim 6, wherein the PID is determined responsive to the time frame associated with the input to the input port, and the position within said time frame.

8. The system as in claim 6, wherein the scheduled data packet is comprised of a time stamp designating the scheduled data packet origination time, wherein the PID is determined responsive to the time stamp.

9. The system as in claim 8, wherein the time-stamp is generated in accordance with the Internet real-time protocol (RTP).

10. The system as in claim 8, wherein the time-stamp is generated by a predefined and predetermined switching node in said system.

11. The system as in claim 1, wherein when there are no scheduled data packet to be transmitted in a time frame, "best effort" data packets are transmitted.

12. The system as in claim 11, further comprising:
a scheduling controller; and
a select buffer controller;
wherein the data packets are scheduled for transmission by the scheduling controller, and responsive to the select buffer controller determining that there are no scheduled data packets to be transmitted in a given time frame, the scheduling controller forwards "best effort" data packets to the serial transmitter.

13. The system as in claim 1, wherein the virtual pipe has a start and an end, and wherein mapping of the scheduled data packets into the start and out from the end is scheduled to occur within a predefined number of time frames.

14. A system for switching data packets from at least one source to at least one destination, wherein the transfer of the data packets is provided during respective ones of a plurality of predefined time frames with predefined time intervals, wherein each of the predefined time intervals is comprised of a plurality of the predefined time frames, and within a predefined position within the time frame, said system comprising:

a plurality of switches with plurality of uniquely addressable input and output ports; wherein the switches are interconnected via communication links;

a common time reference signal coupled to each of the switches;

wherein the common time reference is partitioned into respective ones of the time frames;

wherein a predefined number of contiguous ones of the time frames are grouped into a time cycle; and

wherein a predefined number of contiguous time cycles are grouped into a super cycle;

a time-based routing controller at the input port for determining uniquely to which of the output ports a data packet should be switched responsive to the time-frame of arrival (TOA) of said data packet at the input port, and position of said data packet within said time-frame of arrival (TOA);

a scheduling controller and transmit buffer for forwarding data packets out of the respective output port at a predefined scheduled time frame and position within said time frame.

15. The system as in claim 14, wherein the common time reference reflects the UTC time and is represented as a time frame number within a time cycle, and as a time cycle number within the super cycle.

16. The system as in claim 14, wherein a position delimiter signal is output between every two successive time frames responsive to the common time reference;

wherein the time-based routing controller is further comprised of:

a time-based controller;

a position counter for counting the position delimiter signals in the time frames associated with incoming packets, and for providing an instant position counter value;

a time-based routing table that determines (i) the output ports said respective data packet will be switched to, (ii) a time frame associated with output of the respective data packet, and (iii) position within a time frame for the respective data packet to be output from the output port, responsive to (i) the time-frame of arrival (TOA) and (ii) the instant position counter value.

17. The system as in claim 16, wherein the data packets are comprised of a packet header having a time stamp;

wherein the time of arrival is determined responsive to the time stamp and the common time reference.

18. The system as in claim 16, wherein the data packets are comprised of a packet header, and wherein the time frame associated with output and the position within the time frame for the respective output port are attached to become a part of the packet header.

19. The system as in claim 18,

wherein the system is further comprised of:

a scheduling controller;

wherein the scheduling controller is responsive to the time-frame of arrival (TOA) and within said time frame of arrival to provide an associated out-going time frame and the position in said out-going time frame for output from the output port.

20. The system as in claim 19, wherein the scheduling controller stores data packets in a random access memory buffer responsive to the out-going time frame and the position within said out-going time frame.

21. The system as in claim 1,

wherein all scheduled data packets that are transferred into the respective input port during the first predefined time frame are transferred out from the same output port out of the respective switch during the second predefined time frame.

22. The system as in claim 21,

wherein the scheduled data packets are data units without headers.

23. The system as in claim 22,

wherein the data unit is at least one of a SONET STS-1 frame, a SONET STS-N frame, a fraction of SONET STS-1 frame, a plurality of SONET STS-1 frames, a plurality of asynchronous transfer mode (ATM) cells.

24. A method for transferring a plurality of scheduled data packets from at least one source to at least one destination, wherein the transfer of the scheduled data packets are provided during respective ones of a plurality of predefined time intervals, wherein each of the predefined time intervals is comprised of a plurality of predefined time frames, the method comprising:

interconnecting as a virtual pipe comprising at least two switches in a path via communication links, each of said switches having plurality of input ports and plurality of output ports;

coupling a common timing reference signal to each of the switches;

associating a predefined position within a first predefined time frame within which a scheduled data packet is transferred into the respective input port and an associated separate predefined position within a second predefined time frame within which the respective scheduled data packet is transferred from the output port out of the respective switch, for each of the input ports of each switch.

25. The method as in claim 24, further comprising:

providing predefined positions within a predefined subset of the first predefined time frames during which the scheduled data packets are transferred into the input port of the switch, for each switch, and providing additional predefined positions within an additional predetermined subset of the second

predefined time frames during which the scheduled data packets are transferred from the output port out of the switch, for each switch.

26. The method as in claim 24, further comprising:

forwarding all the scheduled data packets over the same virtual pipe with an assigned pipe identification (PID) associated with that virtual pipe.

27. The method as in claim 26, further comprising:

determining the PID responsive to the time frame associated with the input to the input port, and the position within said time frame.

28. The method as in claim 26, wherein the scheduled data packet is comprised of a time stamp designating the scheduled data packet origination time, the method further comprising:

determining the PID responsive to the time stamp.

29. The method as in claim 24, further comprising:

transmitting "best effort" data packets when there are no scheduled data packets to be transmitted in a time frame.

30. The method as in claim 29, further comprising:

"best effort" scheduling data packets for transmission responsive to determining that there are no scheduled data packets to be transmitted in a given time frame

31. The method as in claim 24, wherein the virtual pipe has a start and an end, the method further comprising:

mapping of the scheduled data packets into the start and out from the end, scheduled to occur within a predefined number of time frames.

32. The method as in claim 24, further comprising:

transferring selected scheduled data packets into the respective input port during the first predefined time frame, and transferring the selected scheduled

data packets out from the same output port out of the respective switch during the second predefined time frame.

33. The method as in claim 32,

wherein the scheduled data packets are data units without headers.

34. The method as in claim 33,

wherein each of the data units is at least one of a SONET STS-1 frame, a SONET STS-N frame, a fraction of SONET STS-1 frame, a plurality of SONET STS-1 frames, a plurality of asynchronous transfer mode (ATM) cells.